

### REMARKS

Applicants request reconsideration of the application in view of this Amendment.

Claims 16-26 are cancelled.

Claims 27-39 are added.

#### Claim 27

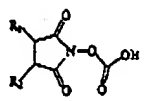
New independent claim 27 is a combination of claims 1, 2, 4 and 5 as originally filed, and is supported in paragraphs [0019] to [0027].

Examiner has rejected the patent application as anticipated/as obvious over the citation U.S. Patent No. 4,843,122 to Stavrianopoulos. Said reference discloses polymers with modified functional groups, which are prepared via reaction with diazo compounds (column 14, line 63 to 66 and scheme IV), via haloacyl compounds like bromo acetyl bromide (column 15, 16 and scheme V), tetrafluoroborates, diketene, imidoesters, sulfonyl halides, and cyanogen bromide (column 17, line 32 to column 18, line 36). However, none of said compounds is an activating compound as claimed in new claim 27.

Furthermore, the reference discloses in scheme VI the reaction of a succinic imide derivative, wherein the nitrogen atom is linked via an oxygen atom to an acyl radical (compound VI-4) with 1-amino-2-mercapto-ethane. As can be seen from said scheme, said reaction leads to N-acylation of 1-amino-2-mercapto-ethane, whereby the succinic imide moiety obviously is eliminated. Therefore, by applying said compound to a polymer with a functional group, the one of ordinary skill would expect the functional group of the polymer to be acylated, wherein the activating succinic imide moiety would be eliminated. However, said one step process would be completely different from the two step process as claimed in new claim 27, wherein first a functional group is reacted with the activating reagent to give a polymer, where the at least one functional group is reacted with the at least one activating reagent (and thereby activated), and wherein in the second step the reaction product from the polymer having at least one functional group and the activating agent is reacted with a derivatizing agent to give the derivatized polymer.

As the reference neither teaches nor suggests the process as claimed in new claim 27, said claim is novel and nonobvious over said reference. Therefore, dependent claims 28 to 31 are novel and nonobvious over the cited prior art, too.

It is important for the Examiner to additionally consider the following: Claim 27 recites two steps. Step (i) comprises reacting a polymer with an activating reagent. Step (ii) comprises reacting the reaction product of step (i) with a derivatizing reagent. The activating reagent is a derivative of a

compound of a structure specified as . The polymer has a functional group selected from OH, NHR<sub>11</sub>, SH, OSO<sub>3</sub>H, SO<sub>3</sub>H, OPO<sub>3</sub>H<sub>2</sub>, OPO<sub>3</sub>HR<sub>11</sub>, PO<sub>3</sub>H<sub>2</sub>, PO<sub>3</sub>HR<sub>11</sub> and COOH.

This is not disclosed by the cited reference to Stavrianopoulos. Stavrianopoulos' scheme VI, cited in the Office Action, does not disclose the claimed step (i) of reacting a polymer with a derivative of the specified structure. Stavrianopoulos' compound VI-4 is not reacted with a polymer as claimed. Although, Stavrianopoulos' compound VI-5 is reacted with a polymer, it is not, as claimed, "a derivative of" the specified structure. That is because the specified structure is completely absent from the structure of VI-5.

Stavrianopoulos' scheme VI further does not disclose the claimed step (ii) of reacting the reaction product of step (i) with a derivatizing reagent.

Even further, Stavrianopoulos lacks a functional group that is, as claimed, included in the functional group list of claim 27 and reacted with the activating reagent. Specifically, the polymer functional group in scheme VI of Stavrianopoulos is Cl, which is not one of those listed in claim 27. The COOH group mentioned elsewhere in Stavrianopoulos, although listed in claim 27, is not reacted with an activating reagent as claimed.

Therefore, claim 27 is not anticipated by the prior art disclosure of Stavrianopoulos under 35 USC §102. Furthermore, Stavrianopoulos does not include any suggestion or motivation for a person of ordinary skill in the art to provide the elements of the claimed invention that are missing from Stavrianopoulos' disclosure. Stavrianopoulos could therefore not have made the claimed invention obvious under 35 USC §103.

#### Claims 28-31

New claim 28 is supported by paragraph [0064] of the description. New claims 29, 30 and 31 relate to claims 7, 8 and 9 as originally filed, however, were formulated as process claims.

Claims 28-31 depend from claim 27. The limitations that they add to claim 27 distinguish the invention further from the prior art. Claims 28-31 are therefore also patentable over the prior art.

**Claim 33**

New independent claim 33 relates to a combination of claims 1, 4 and 5 as originally filed. New claims 36, 37 and 38 relate to claims 7, 8 and 9 as originally filed, however, were formulated as process claims. Claim 37 is supported by paragraph [0084].

Examiner has rejected the patent application as anticipated/as obvious over the citation US 4,843,122. Said reference discloses polymers with modified functional groups, which are prepared via reaction with diazo compounds (column 14, line 63 to 66 and scheme IV), via haloacyl compounds like bromo acetyl bromide (column 15, 16 and scheme V), tetrafluoroborates, diketene, imidoesters, sulfonyl halides, and cyanogen bromide (column 17, line 32 to column 18, line 36). However, none of said compounds is a derivative of an activating compound as claimed in new claim 33.

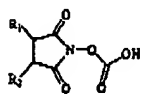
Furthermore, the reference discloses in scheme VI the reaction of a succinic imide derivative, wherein the nitrogen atom is linked via an oxygen atom to an acyl radical (compound VI-4) with the low molecular-weight compound 1-amino-2-mercapto-ethane. One can define said succinic imide as a derivative of compound (I) of the present invention.

However, the reference is silent about the use of derivatives derived from a compound of the structure (I) for the derivatization of polymers with modifiable groups as defined in new claim 33 of the present invention. Said reference does not consider said derivatives to be useful in the modification of polymers with functional groups. On the contrary, the reference prefers other compounds than compounds of the formula (I) of claim 33 to be useful in said modification reaction (see above). No inspiration can be taken from the reference to try derivatives of activating reagents of formula (I) to modify polymers having at least one modifiable reactive group.

Moreover, according to scheme VI, in the reaction of compound VI-4 with the bifunctional low molecular-weight compound 1-amino-2-mercapto-ethane, obviously only reaction with the  $\text{NH}_2$  group occurs, but not with the SH group. However, the one of ordinary skill would expect a mixture of N-acylated and S-acylated products. Thus, knowing the teaching of the citation he would not consider said compound to be effective in a reaction of a polymer with a SH group as functional group as claimed in new claim 33. The same matter would apply to the functional groups  $\text{OSO}_3\text{H}$ ,  $\text{SO}_3\text{H}$ ,  $\text{OPO}_3\text{H}_2$ ,  $\text{OPO}_3\text{HR}_{11}$ ,  $\text{PO}_3\text{H}_2$ ,  $\text{PO}_3\text{HR}_{11}$ ,  $\text{COOH}$  as defined in new claim 33, because said groups are even less reactive (nucleophilic) than the SH group.

However, surprisingly, according to the present invention, polymers with a SH, OSO<sub>3</sub>H, SO<sub>3</sub>H, OPO<sub>3</sub>H<sub>2</sub>, OPO<sub>3</sub>HR<sub>11</sub>, PO<sub>3</sub>H<sub>2</sub>, PO<sub>3</sub>HR<sub>11</sub>, COOH groups can be reacted with a derivative of a derivatizing reagent as disclosed in formula (I) of claim 33. Therefore, independent claim 33 and dependent claims 34 to 38 of the present invention are novel and nonobvious with respect to the citation.

It is important for the Examiner to also consider the following: In contrast to claim 27, claim 33 recites a one-step process. Step (i) comprises reacting a polymer with a derivative of an activating reagent. The activating reagent is a derivative of a compound of the structure specified as



The polymer has a functional group selected from OH, NHR<sub>11</sub>, SH, OSO<sub>3</sub>H, SO<sub>3</sub>H, OPO<sub>3</sub>H<sub>2</sub>, OPO<sub>3</sub>HR<sub>11</sub>, PO<sub>3</sub>H<sub>2</sub>, PO<sub>3</sub>HR<sub>11</sub> and COOH.

This is not disclosed by the cited reference to Stavrianopoulos. In Stavrianopoulos' scheme VI, cited by the Examiner, compound VI-4 is not itself reacted with a polymer. Although Stavrianopoulos' compound VI-5 is reacted with a polymer, it is not, as claimed, a derivative of an activating reagent. That is because the structure of the specified activating reagent is completely absent from the structure of VI-5.

Stavrianopoulos further lacks a functional group that is, as claimed, included in the list of claim 33 and reacted with a derivative of an activating reagent. Specifically, the polymer functional group in Stavrianopoulos' scheme VI is Cl, which is not one of those listed in claim 33. The COOH group mentioned elsewhere in Stavrianopoulos, is not, as claimed, reacted with a derivative of an activating reagent.

Therefore, claim 33 is not anticipated by the prior art disclosure of Stavrianopoulos under 35 USC §102. Stavrianopoulos further does not include any suggestion or motivation for a person of ordinary skill in the art to provide the elements of the claimed invention that are missing from Stavrianopoulos. Stavrianopoulos could therefore not have made the claimed invention obvious under 35 USC §103.

#### Claims 34-38

New claim 34 relates to claim 3 as originally filed. New claim 35 is supported by paragraph [0064] of the description.

Claims 34-38 depend from claim 33. The limitations that they add to claim 33 distinguish the invention further from the prior art. Claims 34-38 are therefore also patentable.

**Product Claims 32 and 39**

Due to the structure of the activating reagent of the formula (I) respectively a derivative of said activating reagent, and as can be seen from the Examples of the present invention, derivatized polymers are formed, wherein the at least one functional group is linked to a carbonyl group. Polymers which are produced according to the citation via diazo compounds, tetrafluoroborates, imidoesters, sulfonylhalides and cyanogenbromide cannot contain such carbonyl groups due to the chemical structure of said activating reagents. Thus, the polymers prepared according to the process of the present invention and polymers produced with the above-mentioned activating reagents of the state of the art are different.

According to the citation, polymers in which the functional group is linked to a carbonyl group after reaction with an activating reagent can only be formed by means of the reaction with diketene or  $\alpha$ -haloacyl group, for example the  $\alpha$ -bromoacetyl bromide of scheme V. Herein, polymers with amino groups as functional groups are the starting material. However, it is known that polymers containing amino groups (or SH or OH groups) are activated by means of said activating agents with low selectivity and a low derivatization degree only. Said drawback will result in mixtures of different polymers, which in the application, that is in the specific binding of substrates, will not perform specific but rather non-specific binding of said substrates. Contrary to the activating reagents of the state of the art, the functional groups of polymers can be activated with the activating reagent respectively the derivatized activating reagent of the present invention with high selectivity, wherein a predetermined derivatization degree can be achieved. According to Example 3 of the application, the derivatization is quantitative with respect to the amount of the activating agent respectively the derivative of the activating agent to be used. Such polymers perform specific binding of substrates. Thus, the polymers prepared according to the process of the present invention and polymers produced with the above-mentioned activating reagents of the state of the art are different.

As pointed out in the application text in paragraph [0079] the processes of the invention allow preparing polymer derivatives, which have very different spatial arrangements. Examples are polymers in the form of hairy rods, comb polymers, networks, baskets, dishes, tubes, funnels or cages (paragraph [0080]). Accordingly, said derivatives can be used for a large number of applications in which the spatial arrangement is of crucial importance. Consequently, polymer derivatives can be supplied from the process of the invention, which are tailor made according to the application of said polymers. The reference does not teach said advantageous behavior nor is said

behavior rendered obvious by the products of the reference prepared according to the processes disclosed therein.

Moreover, the present invention discloses polymers prepared according to the processes of the invention having at least three functional groups wherein at least two groups are derivatized. Said polymers show a particular behavior with suitable substrates. The reference discloses in column 7, lines 49 to 51 that the number of actually modified groups will be less than the number of potentially available modifiable groups. That means that not all functional groups are derivatized. However, the reference does not teach whether the non-modified functional groups have specific or non-specific action with a substrate. In particular, the reference does not give any hint that according to the degree of derivatization and the at least one functional group having non-substrate-specific action lying between two of these derivatized groups the best possible interaction with the substrate can be achieved and adequate solubility of the polymer derivative can be obtained (paragraphs [0086], [0087], [0088]).

Furthermore, the present invention discloses polymers prepared according to the processes of the invention acting as receptor for binding substrates via non-covalent receptor-substrate interaction via at least two different types of interactions (paragraphs [0155] to [0158]). The reference discloses the use of modified polymers in binding processes, for example in immunoassay procedures (column 21, line 53) or in locating hormone receptor sites on the surface of cells (column 22, lines 16 to 22). However, the reference is silent about receptor-substrate interactions, wherein the specific binding of the at least one substrate can take place via at least two different types of interactions on account of the chemical constitution of the receptor groups. The one of ordinary skill would get no inspiration from said reference to develop such derivatives of polymers being capable to interact via at least two different types of interactions with a substrate.

Therefore, independent claims 32 and 39 are novel and nonobvious over the prior art.

Applicants respectfully submit that the application is now in condition for allowance, and allowance is requested.

Respectfully submitted,

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